CLAIMS

1. An RTM molding method comprising the steps of disposing a reinforcing fiber substrate in a cavity of a mold consisting of a plurality of dies, clamping said mold, and thereafter injecting resin to complete molding, characterized in that divided areas with respect to a surface direction of said reinforcing fiber substrate are assumed, each divided area is one in which injected resin expands over the entire surface in said each divided area and can be substantially uniformly impregnated in a thickness direction of said substrate, and resin introducing paths are formed for respective assumed divided areas for introducing the injected resin into said respective divided areas.

2. The RTM molding method according to claim 1, wherein vacuum suction is carried out from a resin discharge line for a predetermined period of time of at least from a time after clamping said mold to a time starting resin injection.

3. The RTM molding method according to claim 1, wherein an intermediate member having resin paths extending through said intermediate member in its thickness direction is disposed between dies forming said mold, and resin is injected to said reinforcing fiber substrate from a plurality of positions via said intermediate member almost simultaneously.

4. The RTM molding method according to claim 3, wherein a groove for discharging resin, which extends substantially over the entire circumference of said reinforcing fiber substrate, is formed on any one of said dies.

5. The RTM molding method according to claim 3, wherein a groove for discharging resin, which extends substantially over the entire circumference of said reinforcing fiber substrate, is formed on said intermediate member.

6. The RTM molding method according to claim 3, wherein said intermediate member is provided with grooves for resin paths formed on its one surface and through holes communicating with said grooves and extending to its reinforcing fiber substrate disposed-side surface opposite to said one surface through said intermediate member.

7. The RTM molding method according to claim 3, wherein said intermediate member is made from a metal or a resin.

8. The RTM molding method according to claim 3, wherein a member for resin injection is nipped and sealed by said intermediate member and a die facing said intermediate member.

9. The RTM molding method according to claim 3, wherein a member for resin discharge is nipped and sealed by said intermediate member and a die facing said intermediate member via said reinforcing fiber substrate.

10. The RTM molding method according to claim 3, wherein said intermediate member is made of a perforated plate or resin film provided with a plurality of through holes.

11. The RTM molding method according to claim 10, wherein a groove for a resin path is provided on a die facing said intermediate member.

12. The RTM molding method according to claim 10, wherein a gap is formed between said intermediate member and a die facing said intermediate member, and said gap is set in a range of 1 to 10 mm.

13. The RTM molding method according to claim 3, wherein a core material is laminated to said reinforcing fiber substrate.

14. The RTM molding method according to claim 3, wherein a tube for resin injection and/or a tube for resin discharge is provided being nipped between parting surfaces of dies, and portions between said tube and said dies are sealed with an elastic material.

15. The RTM molding method according to claim 14, wherein an end portion of an O-ring for sealing said cavity of said mold at positions of parting surfaces of dies is incorporated into said elastic material for seal.

16. The RTM molding method according to claim 3, wherein, while resin is injected into said mold at a pressurized condition, gas and excessive resin in said mold are discharged intermittently.

17. The RTM molding method according to claim 16, wherein, when a resin pressure in said mold of resin pressurized and injected is referred to as Pm and a resin discharge pressure at an injection port for injecting resin is referred to as Pi, a flow rate of resin flowing into said mold is controlled by selective control between conditions of Pm=Pi and Pm<Pi.

18. The RTM molding method according to claim 16, wherein a flow rate of resin flowing into said mold is controlled by adjustment of a diameter of a discharge port for discharging resin.

19. The RTM molding method according to claim 18, wherein said adjustment of said diameter of said discharge port and a timing for said adjustment are stored in memory, and

based on the stored information, said flow rate of resin flowing into said mold is automatically controlled.

20. The RTM molding method according to claim 3, wherein, when resin is injected into said cavity of said mold at a pressurized condition, a ratio of a flow rate of resin per a unit time (Q: cc/min.) to a projected area of said cavity (S: m^2) (Q/S: cc/min. $\cdot$ m^2) is in a range of $50<Q/S<600$.

21. The RTM molding method according to claim 20, wherein the product of said ratio (Q/S: cc/min. $\cdot$ m^2) and a pressurizing force of resin (P: MPa) ((Q/S)xP: ccMPa/min. $\cdot$ m^2) is in a range of $20 \leqq (Q/S)xP \leqq 400$.

22. The RTM molding method according to claim 20, wherein a pressurizing force of resin is in a range of 0.2 to 0.8 MPa.

23. The RTM molding method according to claim 20, wherein said resin is cured for 3 to 30 minutes at a constant heating temperature in a range of 60 to 160℃.

24. The RTM molding method according to claim 1, wherein, after resin is impregnated into said reinforcing fiber substrate by injecting the resin from a resin injection line toward a resin discharge line, which are disposed on an outer circumference of said cavity, the resin is heated and cured, and said resin injection line is divided into a plurality of parts.

25. The RTM molding method according to claim 24, wherein said resin injection line and resin discharge line are formed substantially over the entire range of said outer circumference of said cavity.

26. The RTM molding method according to claim 24, wherein the length of said resin injection line is two times or more the length of said resin discharge line.

27. The RTM molding method according to claim 24, wherein said resin injection line and/or said resin discharge line is formed from a groove processed on said mold.

28. The RTM molding method according to claim 27, wherein said mold comprises an upper die and a lower die, and said groove is all processed on said lower die.

29. The RTM molding method according to claim 24, wherein said resin discharge line is also divided into a plurality of parts.

30. The RTM molding method according to claim 24, wherein resin injection from said resin injection line divided into a plurality of parts is carried out in order from a resin injection line part which is substantially more distant from said resin discharge line.

31. The RTM molding method according to claim 24, wherein resin injection is carried out also from said resin discharge line by switching said resin discharge line to a resin injection line after a predetermined period of time.

32. The RTM molding method according to claim 24, wherein a core material is laminated to said reinforcing fiber substrate.

33. The RTM molding method according to claim 24, wherein a tube for resin injection and/or a tube for resin discharge is provided being nipped between parting surfaces of dies,

and portions between said tube and said dies are sealed with an elastic material.

34. The RTM molding method according to claim 33, wherein an end portion of an O-ring for sealing said cavity of said mold at positions of parting surfaces of dies is incorporated into said elastic material for seal.

35. The RTM molding method according to claim 24, wherein, while resin is injected into said mold at a pressurized condition, gas and excessive resin in said mold are discharged intermittently.

36. The RTM molding method according to claim 35, wherein, when a resin pressure in said mold of resin pressurized and injected is referred to as Pm and a resin discharge pressure at an injection port for injecting resin is referred to as Pi, a flow rate of resin flowing into said mold is controlled by selective control between conditions of Pm=Pi and Pm<Pi.

37. The RTM molding method according to claim 35, wherein a flow rate of resin flowing into said mold is controlled by adjustment of a diameter of a discharge port for discharging resin.

38. The RTM molding method according to claim 37, wherein said adjustment of said diameter of said discharge port and a timing for said adjustment are stored in memory, and based on the stored information, said flow rate of resin flowing into said mold is automatically controlled.

39. The RTM molding method according to claim 24, wherein, when resin is injected into said cavity of said mold at a pressurized condition, a ratio of a flow rate of resin per a unit

time (Q: cc/min.) to a projected area of said cavity (S: m^2) (Q/S: cc/min. · m^2) is in a range of $50<Q/S<600$.

40. The RTM molding method according to claim 39, wherein the product of said ratio (Q/S: cc/min. · m^2) and a pressurizing force of resin (P: MPa) ((Q/S)xP: ccMPa/min. · m^2) is in a range of $20 \leqq (Q/S)xP \leqq 400$.

41. The RTM molding method according to claim 39, wherein a pressurizing force of resin is in a range of 0.2 to 0.8 MPa.

42. The RTM molding method according to claim 39, wherein said resin is cured for 3 to 30 minutes at a constant heating temperature in a range of 60 to 160℃.

43. The RTM molding method according to claim 1, wherein at least one surface layer of said reinforcing fiber substrate comprises a continuous fiber layer, and a layer positioned immediately under said surface layer comprises a random mat layer.

44. The RTM molding method according to claim 43, wherein said surface layer is formed from three or less continuous fiber layers.

45. The RTM molding method according to claim 43, wherein the total weight of said continuous fiber layer forming said surface layer is 700 g/m^2 or less.

46. The RTM molding method according to claim 43, wherein reinforcing fibers of said surface layer are formed as a carbon fiber woven fabric.

47. The RTM molding method according to claim 43, wherein the total weight of said random mat layer is 150 g/m^2 or less.

48. The RTM molding method according to claim 43, wherein said random mat layer comprises glass fibers.

49. The RTM molding method according to claim 43, wherein a core material is laminated to said reinforcing fiber substrate.

50. An RTM molding device for disposing a reinforcing fiber substrate in a cavity of a mold consisting of a plurality of dies, clamping said mold, and thereafter injecting resin to complete molding, characterized in that divided areas with respect to a surface direction of said reinforcing fiber substrate are assumed, each divided area is one in which injected resin expands over the entire surface in said each divided area and can be substantially uniformly impregnated in a thickness direction of said substrate, and resin introducing paths are formed for respective assumed divided areas for introducing the injected resin into said respective divided areas.

51. The RTM molding device according to claim 50, wherein said device has means for carrying out vacuum suction from a resin discharge line for a predetermined period of time of at least from a time after clamping said mold to a time starting resin injection.

52. The RTM molding device according to claim 50, wherein an intermediate member having resin paths extending through said intermediate member in its thickness direction is disposed between dies forming said mold for injecting resin to said reinforcing fiber substrate from a plurality of positions via said resin paths almost simultaneously.

53. The RTM molding device according to claim 52, wherein a groove for discharging resin, which extends substantially over the entire circumference of said reinforcing fiber substrate, is formed on any one of said dies.

54. The RTM molding device according to claim 52, wherein a groove for discharging resin, which extends substantially over the entire circumference of said reinforcing fiber substrate, is formed on said intermediate member.

55. The RTM molding device according to claim 52, wherein said intermediate member is provided with grooves for resin paths formed on its one surface and through holes communicating with said grooves and extending to its reinforcing fiber substrate disposed-side surface opposite to said one surface through said intermediate member.

56. The RTM molding device according to claim 52, wherein said intermediate member is made from a metal or a resin.

57. The RTM molding device according to claim 52, wherein a member for resin injection is provided, which is nipped and sealed by said intermediate member and a die facing said intermediate member.

58. The RTM molding device according to claim 52, wherein a member for resin discharge is provided, which is nipped and sealed by said intermediate member and a die facing said intermediate member via said reinforcing fiber substrate.

59. The RTM molding device according to claim 52, wherein said intermediate member is

made of a perforated plate or resin film provided with a plurality of through holes.

60. The RTM molding device according to claim 59, wherein a groove for a resin path is provided on a die facing said intermediate member.

61. The RTM molding device according to claim 59, wherein a gap is formed between said intermediate member and a die facing said intermediate member, and said gap is set in a range of 1 to 10 mm.

62. The RTM molding device according to claim 52, wherein a core material is laminated to said reinforcing fiber substrate.

63. The RTM molding device according to claim 52, wherein a tube for resin injection and/or a tube for resin discharge is provided being nipped between parting surfaces of dies, and an elastic material for seal is interposed between said tube and said dies.

64. The RTM molding device according to claim 63, wherein an end portion of an O-ring for sealing said cavity of said mold at positions of parting surfaces of dies is incorporated into said elastic material for seal.

65. The RTM molding device according to claim 52, wherein means for, while injecting resin into said mold at a pressurized condition, discharging gas and excessive resin in said mold intermittently is provided.

66. The RTM molding device according to claim 65, wherein, when a resin pressure in said mold of resin pressurized and injected is referred to as Pm and a resin discharge pressure at an

injection port for injecting resin is referred to as Pi, means for controlling a flow rate of resin flowing into said mold by selective control between conditions of Pm=Pi and Pm<Pi is provided.

67. The RTM molding device according to claim 65, wherein means for controlling a flow rate of resin flowing into said mold by adjusting a diameter of a discharge port for discharging resin is provided.

68. The RTM molding device according to claim 67, wherein means for storing in memory said adjustment of said diameter of said discharge port and a timing for said adjustment, and based on the stored information, automatically controlling said flow rate of resin flowing into said mold, is provided.

69. The RTM molding device according to claim 67, wherein said means for adjusting said diameter of said discharge port comprises a valve opening/closing device.

70. The RTM molding device according to claim 50, wherein, after resin is impregnated into said reinforcing fiber substrate by injecting the resin from a resin injection line toward a resin discharge line, which are disposed on an outer circumference of said cavity, the resin is heated and cured, and said resin injection line is divided into a plurality of parts.

71. The RTM molding device according to claim 70, wherein said resin injection line and resin discharge line are formed substantially over the entire range of said outer circumference of said cavity.

72. The RTM molding device according to claim 70, wherein the length of said resin

injection line is two times or more the length of said resin discharge line.

73. The RTM molding device according to claim 70, wherein said resin injection line and/or said resin discharge line is formed from a groove processed on said mold.

74. The RTM molding device according to claim 73, wherein said mold comprises an upper die and a lower die, and said groove is all processed on said lower die.

75. The RTM molding device according to claim 70, wherein said resin discharge line is also divided into a plurality of parts.

76. The RTM molding device according to claim 70, wherein resin injection from said resin injection line divided into a plurality of parts is carried out in order from a resin injection line part which is substantially more distant from said resin discharge line.

77. The RTM molding device according to claim 70, wherein resin injection is carried out also from said resin discharge line by switching said resin discharge line to a resin injection line after a predetermined period of time.

78. The RTM molding device according to claim 70, wherein a core material is laminated to said reinforcing fiber substrate.

79. The RTM molding device according to claim 70, wherein a tube for resin injection and/or a tube for resin discharge is provided being nipped between parting surfaces of dies, and an elastic material for seal is interposed between said tube and said dies.

80. The RTM molding device according to claim 79, wherein an end portion of an O-ring for sealing said cavity of said mold at positions of parting surfaces of dies is incorporated into said elastic material for seal.

81. The RTM molding device according to claim 70, wherein means for, while injecting resin into said mold at a pressurized condition, discharging gas and excessive resin in said mold intermittently is provided.

82. The RTM molding device according to claim 81, wherein, when a resin pressure in said mold of resin pressurized and injected is referred to as Pm and a resin discharge pressure at an injection port for injecting resin is referred to as Pi, means for controlling a flow rate of resin flowing into said mold by selective control between conditions of Pm=Pi and Pm<Pi is provided.

83. The RTM molding device according to claim 81, wherein means for controlling a flow rate of resin flowing into said mold by adjusting a diameter of a discharge port for discharging resin is provided.

84. The RTM molding device according to claim 83, wherein means for storing in memory said adjustment of said diameter of said discharge port and a timing for said adjustment, and based on the stored information, automatically controlling said flow rate of resin flowing into said mold, is provided.

85. The RTM molding device according to claim 83, wherein said means for adjusting said diameter of said discharge port comprises a valve opening/closing device.